

**REMARKS****Rejection of Claims and Traversal Thereof**

In the November 1, 2004 Office Action:

claims 1-3, 11, 12 and 37 were rejected under 35 USC §102(b) as being anticipated by U. S. Patent No. 5,583,205 issued to Rees, Jr. (hereinafter Rees '205); and

claims 8-10 and 16 were rejected under 35 USC §103(a) as being unpatentable over U. S. Patent No. 5,583,205 issued to Rees, Jr. in view of U. S. Patent No. 6,159,855 issued to Vaartstra (hereinafter Vaartstra '855).

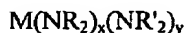
These rejections are hereby traversed. Reconsideration of the patentability of the pending claims is therefore requested in light of the following remarks.

**Rejection under 35 USC §102(b)**

Claims 1-3, 11, 12, and 37 were rejected under 35 USC §102(b) as being anticipated by Rees '205. Applicants submit that Rees '205 does not anticipate applicants' claimed invention.

Applicants' claim 1, as amended herein, reads as follows:

1. A liquid CVD precursor composition for forming a thin film dielectric on a substrate, such precursor composition including at least one metalloamide source reagent compound having a formula:

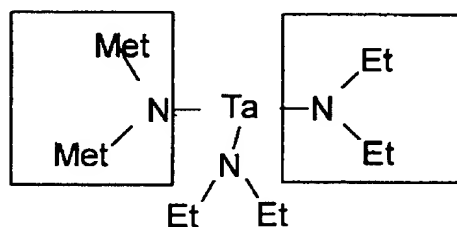


wherein M is selected from the group consisting of: Y, Hf, La, and Ta; N is nitrogen, each of R and R' is independently selected from the group consisting of H, aryl, perfluoroaryl, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>1</sub>-C<sub>8</sub> perfluoroalkyl, and alkylsilyl; (NR<sub>2</sub>)<sub>x</sub> and (NR'<sub>2</sub>)<sub>y</sub> are different amino ligands and R' is different from R; x is from 1 to 5; y is from 1 to 5; and x+y is equal to the oxidation state of metal M, and a solvent medium, wherein the metalloamide source reagent compound is soluble or suspendable therein.

To anticipate a claim the prior art reference must disclose each and every element of the claimed invention as arranged as in the claim (See *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 221 USPQ 481, 485 (Fed. Cir. 1984)).

Rees '205 does not meet this standard, and as such, is not an anticipatory reference. Specifically, Rees '205 is completely devoid of any teaching or suggestion of using a solvent with the metal amides disclosed in the Rees '205 specification. Further, it is well settled in the law, that a reference that includes a generic chemical formula providing an exhaustive list of compounds is not anticipatory unless the claimed subclass of compounds is clearly named or can at once be envisioned from the formula. One may look to the preferred embodiments to determine which compounds can be anticipated. See *In re Petering*, 133 USPQ 275 (CCPA 1962). However, even the preferred embodiments of Rees '205 do not provide any guidance for applicant's claimed structures.

Applicants claimed compounds are very specific in that there are two separate and distinct amino ligands attached to the metal. Further, the first amino ligand is substituted with two R groups that are exactly the same and this same R group on the first amino ligand is different from the R' group substituted on the second amino ligand. Thus, an example would be as shown below:



In contrast, the preferred embodiments described in the Rees '205 reference are either heteroleptic or homoleptic. Table 1 and Table 2 from the Rees '205 reference illustrate the preferred embodiments, as recreated below for ease of discussion.

TABLE 1

$\left[ \begin{array}{c} R_1 \\   \\ M - N \\   \\ R_2 \end{array} \right]_3$			5
F-series Metal	R <sub>1</sub>	R <sub>2</sub>	
Er	TMS	TMS	10
La	TMS	TMS	
Y	TMS	TMS	
Pr	TMS	TMS	

TABLE 2

$  \begin{array}{c}  R_1 \quad R'_1 \\  \diagdown \quad \diagup \\  N - Zn - N \\  \diagup \quad \diagdown \\  R_2 \quad R'_2  \end{array}  $				
R <sub>1</sub>	R <sub>2</sub>	R' <sub>1</sub>	R' <sub>2</sub>	vapor pressure mm/Hg
TMS	iPr	TMS	iPr	0.06/54
TMS	tBu	TMS	tBu	0.2/80
TMS	TMS	TMS	tBu	0.1/63
TMS	TMS	TMS	iPr	0.1/105
TMS	Ph	TMS	Ph	0.25/194
TMS	TMS	TMS	Ph	0.06/85
DMS	iPr	DMS	iPr	0.1/200
TMS	nPr	TMS	nPr	0.02/123
TMS	Cyhex	TMS	Cyhex	—
Cyhex	Cyhex	Cyhex	Cyhex	0.17/99
iPr	iPr	iPr	iPr	—

It is evident from the compounds set forth in these two table that none of the compounds includes two different amino ligands where in the R groups in first amino ligand are the same but different from the R' groups in the second amino ligand. Thus, applicants' claimed compounds are not anticipated by the Rees' 205 disclosure because "one of ordinary skill in the art must be able to draw the structural formula or write the name of each of the compounds included in the generic formula before any of the compounds can be " at once envisaged" according to the *Petering* court. This is not possible from viewing the disclosed compounds of Rees '205.

Applicants therefore respectfully request withdrawal of the §102(b) rejection of claims 1-3, 11, 12, and 37 based on Rees '205.

#### Rejection under 35 USC §103(a)

Claims 8-10 and 16 were rejected under 35 USC §103(a) as being unpatentable over Rees '205 in view Vaartstra '855. Applicants respectfully traverse this rejection and submit that Rees '205 in combination with Vaartstra '855 does not render applicants' claimed invention *prima facie* obvious.

The Office recognizes that Rees '205 does not teach or suggest the use of solvents for CVD precursor. To remedy the shortcoming of Rees '205, the Office introduces the teachings of Vaartstra '855. However, this proposed combination does not establish a *prima facie* case of obviousness.

According to the Office:

"Inasmuch as Rees does not teach away from the use of a solvent and one of ordinary skill knows very well that solvents are used to enable delivery to the reactor in controlled concentration, one of ordinary skill would be motivated to use the solvents of Vaartstra in order to deliver the CVD precursors to the reaction chamber in controlled quantities without thermally decomposing the CVD precursors by otherwise melting them."

Applicants vigorously disagree and submit that one skilled in the art would recognize the importance of reducing contamination and the steps taken in the Rees '205 reference to accomplish this result. Initially, after reviewing the Rees '205 reference, it is evident that the synthesized erbium amide product (F-series metal amide) must be handled and maintained in an inert atmosphere as discussed at column 5 lines 60-62. Specifically, Rees '205 states that:

"[d]ue to the moisture and oxygen sensitivity of F-series metal amides, it is necessary to prepare these compounds in an inert atmosphere."

Thus, whether the Rees '205 compounds are being synthesized or the synthesis is complete, the compounds must be maintained in an inert atmosphere. When the tris bis (trimethylsilyl) erbium amide was prepared in Example 1, it was synthesized in an atmosphere of dry nitrogen or argon. This is important to reduce contamination of the compounds or the oxidation of same. It is evident that mixing the F-series metal amide compounds with a solvent would exhibit adverse results relative to the recommendations set forth in the Rees '205 reference. Notably, one of the important aspects of the Rees '205 reference relates to the level of contamination as determined in the examples of Rees '205. Thus, one recognizing the importance of reducing contamination of the deposited layer would not be tempted to add a solvent that can cause contamination of the deposited layers.

Further proof of the importance of a purified F-series metal amide, as described in Rees '205, is shown in the examples describing the deposition process. Reviewing Example 3, one skilled in the art recognizes that the use of a solvent medium was clearly avoided. The tris bis (trimethylsilyl) erbium amide as prepared in Example 1, which has a decomposition temperature of 275°C, a sublimation temp of 175°C, and a melting temperature of 162°C, was melted in a bubbler and then sublimed at 175°C. The vapors were mixed with a carrier gas and then deposited as an erbium layer. It was found that this layer comprised essentially no contamination except for some minor atmospheric contamination that occurred during the deposition process. Importantly, it should be noted that the sublimation temperature of the pure compound (175°C) was consistent with the

sublimation temperature of the melted compound during the deposition process. Thus, it is evident to one skilled in the art that no solvent was used in the process and in fact specifically avoided.

As discussed above, the Office states that:

"one of ordinary skill would be motivated to use the solvents of Vaartstra in order to deliver the CVD precursors to the reaction chamber in controlled quantities without thermally decomposing the CVD precursors by otherwise melting them."  
(emphasis added)

However, it should be noted that Rees '205 did melt the erbium metal amide compound and heated such melted form to the sublimation temperature for vaporization of the compound. Obviously, melting did not affect the precursor compound and it was not thermally decomposed. The decomposition temperature of the compound of Example 1 is approximately 100 degrees higher than the sublimation temperature, and as such, there is no incentive to use a solvent to deliver the precursors for subsequent deposition, as proposed by the Office.

According to the Office, one skilled in the art would disregard the teachings of Rees '205 that describe a purified solid precursor that is liquefied by melting same for subsequent subliming, and instead, decide that the solid precursor materials of Rees '205 should be dissolved in a solvent to form a liquid material for flash vaporization, such as described in Vaartstra '855, even though there is no teaching or suggestion to modify the Rees '205 reference.

Vaartstra '855 describes the use of at least two separate and distinct metalloamide compounds dissolved in a solvent for use in a "flash vaporization system." Flash vaporization involves the delivery of a liquid material mixture that is vaporized when it makes contact with a highly heated surface, as stated in column 9, of Vaartstra '855,

Regardless of how the liquid multi-metallic is provided or obtained, the invention includes the step of contacting the mixture with a heated surface. This contacting step imparts energy to the mixture, and causes the mixture to vaporize. The so-formed vapor will include at least two non-identical metals, and thus is referred to herein as a multi-metallic vapor.

Applicants should not have to go into the multiple differences between chemical vapor deposition methods and flash vaporization methods, but suffice it to say that one skilled in the art views these methods very differently and would not look to methods describing flash vaporization to improve

or modify the chemical vapor deposition method of Rees '205. Further, the delivery of precursors in a CVD method is entirely different from the delivery for flash vaporization.. As stated above, the compounds of Vaartstra '855 are dissolved in a solvent to provide for a mixture of the two different compounds. Importantly, it is also stated that the "formation of solvates between the metalloamide compound and the solvent is not necessarily undesirable." (see column 8, lines 34-36) Clearly, this is an event that the Rees' 205 reference is attempting to avoid.

The Office has not identified any objective or specific teachings or suggestions in the cited references that would motivate one skilled in the art to combine the references. The Rees '205 reference is completely silent on using a solvent and instead implicitly teaches away from the use of any material that would cause contamination of the deposited surface. Further, the methods of deposition are entirely different, and the Office has not provided any insight as to why one skilled in the art would disregard the necessary requirements for flash vaporization and combine with a method of chemical vapor deposition. Thus, the Office seems to be merely reinterpreting the prior art in light of applicants' disclosure, in order to reconstruct applicants' claimed invention, but without any instructional or motivating basis in the references themselves. Such approach is improper and legally insufficient to establish any *prima facie* case of obviousness.

In order to determine obviousness, it is incumbent upon the Office to view the applicants' invention as a whole. *In re Wesslau*, 174 U.S.P.Q. 393 (C.C.P.A. 1965). Concurrently, the Office must consider the teachings of any cited reference in their respective entireties. Certain individual features from the references may not be arbitrarily chosen (while arbitrarily discarding other disclosed features) to merely lump together disparate features of different references as a mosaic in an attempt to meet the features of the rejected claims. For instance, why would anyone reading Rees '205, which avoids introducing any possible contamination into a purified product that is subsequently used in a chemical vapor deposition method look to Vaartstra '855 that finds "formation of solvates between the metalloamide compound and the solvent is not necessarily undesirable" and uses a flash vaporization method for deposition? Clearly, one skilled in the art would not.

Applicants submit that if the teachings of Rees' 205 and Vaartstra '855 are combined, then the products of Rees '205 will be rendered unsatisfactory for its intended use or change the principle of operation. According to the court in *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), if proposed modification would render the prior art invention being modified unsatisfactory

for its intended purpose, then there is no suggestion or motivation to make the proposed modification. Clearly, Rees '205 avoids the use of additional material that would require vaporization and that could introduce contamination on the deposited surface. Further, the solid compounds of Rees '205 are not prepared for use with a flash vaporization system.

The Office proposes that the two references can be combined to teach and suggest applicants' claimed invention. However, even if the two references were combinable (despite the absence of any proper basis for such combination), the resultant combination would still not provide an enabling disclosure that teaches or suggests every limitation required by applicants' claimed invention. As stated in applicants' response of August 16, 2004, Vaartstra '855 suffers from the same shortcoming as that of Rees' '205 in that a vast number of structures are encompassed under the broad generic formulas with no indication of a metalloamide that comprises two different amino ligands wherein one amino ligand is fully substituted with the same R group and the other amino ligand is fully substituted with the same R' group, but that is different from R. As previously discussed, the *Jones* court found that if the prior art reference encompassed a "potentially infinite genus" but did not disclose or suggest the claimed compounds, the claimed compounds were not render obvious. *In re Jones* 21 USPQ2d 1941, (Fed. Cir. 1992). This is the present situation and the broad generic formulas of Rees '205 and Vaartstra '855 do not render applicants' claimed compounds obvious because the presently exemplified formula is not disclosed or suggested in either reference.

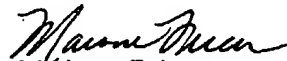
In light of the above discussion and the fact that (1) there is no motivation, suggestion or teaching to combine the references; (2) each and every recited limitation of applicants' claimed invention is not disclosed or suggested in the cited references; (3) Rees '205 teaches away from using a solvent as described in Vaartstra '855; and (4) even if the references were combinable the primary reference Rees '205 will not operate as intended, it is clear that the cited combination fails to establish a *prima facie* case of obviousness of applicants' claims as herein amended.

Accordingly, applicants respectfully submit that all pending claims are patentably distinguishable over the proposed combination of Rees '205 and Vaartstra '855. Withdrawal of this rejection is respectfully requested.

### Conclusion

The pending claims 1-3, 8, 10-12, 16 and 37, as now amended, meet all disclosure requirements and patentably distinguish over the cited prior art, and in view of the forgoing remarks, it is respectfully requested that all rejections be withdrawn thereby placing the application in condition for allowance. Notice of the same is earnestly solicited. In the event that any issues remain, Examiner Kielin is requested to contact the undersigned attorney at (919) 419-9350 to resolve same.

Respectfully submitted



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